UNITED STATES DEPARTMENT OF AGRICULTURE FOREST SERVICE INYO NATIONAL FOREST

BIOLOGICAL ASSESSMENT/BIOLOGICAL EVALUATION FOR THREATENED, ENDANGERED, AND SENSITIVE PLANTS

Forest-Wide Invasive Plants Treatment Project

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1 INTRODUCTION

The purpose of this Biological Evaluation is to provide an analysis of the activities proposed under the Forest-Wide Invasive Plants Treatment Project and to determine whether they have the potential to affect any Federally Endangered, Threatened, Proposed or Candidate plant species, or Forest Service Region 5 Sensitive plant species.

The Invasive Plants Treatment Project is proposed by the Inyo National Forest (INF). It includes two alternatives and is described in detail in the Invasive Plants Treatment Draft Environmental Assessment. This report analyzes the effects of both the Proposed Action (Alternative 1) and No Action (Alternative 2). The project includes manual, mechanical, cultural, biological, and chemical treatment options for invasive plants of management concern on the INF. Existing infestations as well as infestations detected in the future would be prioritized for treatment, with site-specific methods developed and reviewed annually by an interdisciplinary team. The project area encompasses all federal lands managed or administered by the INF (approximately two million acres) in Fresno, Inyo, Madera, Mono and Tulare Counties, California, and Esmerelda and Mineral Counties, Nevada.

2 CURRENT MANAGEMENT DIRECTION

2.1.1 Federal Law

Endangered Species Act (16 USC 1531 et seq.): This biological evaluation is being prepared in accordance with the Endangered Species Act of 1973 as amended (16 USC 1531 et seq.). Under this act, federal agencies must ensure that any action authorized, funded, or carried out by the agency is not likely to (a) jeopardize the continued existence of any listed species or (b) result in the destruction or adverse modification of a listed species' designated critical habitat. Section 7 of the act requires federal agencies to consult the U.S. Fish and Wildlife Service concerning listed (i.e. threatened or endangered) plant species that fall under their jurisdiction.

2.1.2 Forest Service Direction

Forest Service Manual, Section 2670 (USDA 2005): Provides policy for the protection of sensitive species and calls for the development and implementation of management practices to ensure that species do not become threatened or endangered because of Forest Service actions. It requires a review of all activities or programs that are planned, funded, executed, or permitted for possible effects on federally listed or Forest Service sensitive species (FSM 2672.4, USDA 2005).

A Biological Evaluation (BE) provides the means to conduct this review, analyze the significance of potential adverse effects, and determine how negative impacts will be minimized or avoided for those species whose viability has been identified as a concern. The objectives of a BE are to:

- ensure that Forest Service actions do not contribute to loss of viability of any native or desired nonnative plant or animal species;
- ensure that Forest Service actions do not jeopardize or adversely modify critical habitat of Federally listed species; and
- provide a process and standard through which rare plant species receive full consideration throughout the planning process, reducing negative impacts on species and enhancing opportunities for mitigation.

2.1.3 Regional and Forest Plan Direction

Inyo National Forest Land & Resource Management Plan (LRMP) (USDA 1988): Standard and guidelines for sensitive plants required the "development and implementation of a consistent, systematic, biologically sound strategy to manage sensitive species and their habitats so that federal listing does not occur" (USDA Forest Service, 1988). The INF Sensitive Plant Management Plan (USDA Forest Service, 1991) was developed to meet this S&G; it states that District and Forest activities will not disturb any plant population or part of a sensitive plant's essential habitat until its status is determined through a biological evaluation. After an evaluation is completed, no action will be taken that will cause a population to fall below the number of individuals necessary to maintain a viable population. This direction implements the protections legislated in the National Forest Management Act and the Endangered Species Act.

Sierra Nevada Forest Plan Amendment (SNFPA) Final Supplemental Environmental Impact Statement (USDA 2004b): Establishes standards and guidelines pertaining to the protection and consideration of sensitive plants, including conducting field surveys, minimizing or eliminating direct and indirect impacts from management activities, and adhering to the Regional Native Plant Policy (USDA 1994).

3 Description of the Proposed Project

Proposed activities under the Proposed Action (Alternative 1) and the No Action (Alternative 2), including the project design criteria, are described below.

3.1 Proposed Action (Alternative 1)

The Proposed Action is to annually treat a portion of the invasive plant infestations on the Inyo NF, focusing on high priority species and infestations. Proposed treatments will follow an Integrated Pest Management (IPM) approach, which combines prevention, control, and restoration measures. Control measures would involve integrated prescriptions that typically combine the use of manual, mechanical, cultural, and chemical methods over several years. Herbicides are used only after monitoring indicates they are needed, and treatments are made with the goal of removing only the target organism. Restoration measures may include seeding or planting native species and mulching.

Treatments of newly discovered (currently unmapped) infestations or species of invasive plants would occur according to the Early Detection Rapid Response (EDRR) approach, which is designed to allow for control of new invasive plant infestations as soon as possible after their detection. EDRR treatments could occur outside of currently mapped areas, but treatments in these areas would be developed and reviewed through the Annual Implementation Process.

3.1.1 Project Area

This project covers all lands administered by the Inyo NF (approximately 2 million acres). Areas proposed for treatment (invasive plant infestations) fall into three categories:

- 1) <u>Currently mapped infestations</u>. A total of 45,845 acres are currently mapped as infested with invasive plants as of early 2018.
- 2) <u>Growth of mapped infestations</u>. Untreated infestations will generally continue to increase in size. The proposed action would allow for treatment of enlarging infestations.

3) <u>Infestations discovered subsequent to this analysis</u>. The proposed action would allow for treatment of newly discovered (currently unmapped) infestations or species of invasive plants as described under the EDRR section.

3.1.2 Treatment Strategy

Infestations would be prioritized for treatment based on the following factors:

- Early invaders with high environmental impacts (per CDFA and Cal-IPC ratings) and/or small or few isolated infestations on the forest.
- Infestations in special status areas (e.g. Wilderness, Ancient Bristlecone Pine Forest, sage grouse or other special status species habitat) and associated points of access.
- Infestations with a high potential for future spread prolific species found in high traffic areas such as administrative or recreation sites, trailheads, major access points for the forest, and systems vulnerable to invasion (recent fires or fuelbreaks).
- Leading edge or satellite occurrences of larger more established infestations.

Infestations or species that do not fit into the above categories may be targeted for treatment if resources become available, but are currently a lower priority.

For each known or newly discovered invasive plant infestation, one of four treatment strategies would be implemented:

- 1. Eradicate: Annually treat and monitor the infestation with the goal of complete elimination of the species (57 acres; e.g. knapweeds, perennial pepperweed).
- 2. Control: Treat and monitor a portion of the infestations each year, focusing on reducing the acreage and percent cover over time (1,431 acres; e.g. tamarisk).
- 3. Contain: Treat leading edge or new satellite infestations, or where concurrent with high-value resources (40,175 acres; e.g. Russian thistle, cheatgrass, black locust).
- 4. Limited/No treatment: Limited to site-specific restoration projects or no treatment efforts at this time (4,180 acres; e.g. woolly mullein, dandelion).

3.1.3 Treatment Methods

Treatments are tailored depending on the biology of the target invasive plant species, population size and density, site type, and prior treatment effectiveness. Complete eradications typically require annual treatment over 3-5 years or longer to ensure there is no regrowth or new seed germination. Treatments aimed at reducing numbers or preventing further spread may occur on a less frequent but ongoing schedule.

Manual and Mechanical Methods

- 1. Manual removal, including hand-pulling or digging using hand tools such as shovels, hoes, or weed wrench.
- 2. Cutting of woody species using a hand saw or chainsaw (often requires subsequent herbicide treatment of resprouting stems).

- 3. Mowing before seed set with hand-held power tool (e.g. string-trimmer) or mowers.
- 4. Clipping seed heads and/or fruiting bodies to prevent seed dispersal.

Cultural Methods

- Tarping or solarization by covering the infested area with a barrier, usually plastic, to raise soil temperature and block light. Mulch, such as wood chips or rice straw, may be used to smother or shade out invasive plants.
- 2. Flaming using a hand-held propane torch raises the leaf temperature to the point of bursting cells and does not require igniting vegetation. This method is applied prior to seeds becoming viable in the late winter or early spring when fire danger is low. Fire personnel would be on site for the use of this method, to provide for human safety and to ensure there is no potential for fire spread from the treated area. Exposing a plant to high levels of blue light using a hand-held light wand (e.g. NatureZap or similar) or mounted light system disables the photosynthesis pathway causing the plant to die. These methods would only be considered for herbaceous species.

Chemical Methods

Eight herbicides are proposed for use (see Table 1 in the Project EA). All herbicides proposed are registered for use in California and Nevada and would be applied according to label directions and project design features, using ground-based methods to terrestrial systems only. Proposed herbicide application methods include:

- 1. <u>Hand Application:</u> Herbicide application is conducted by a hand-held applicator and no spraying occurs, thereby limiting the likelihood of drift.
 - a. <u>Cut-Stump</u>: The trunk or branches are cut through and the stump is immediately painted with herbicide. Herbicide may also be "daubed" directly on the cut surface using a sponge wand or dripped using squeeze bottles. Follow up treatment of re-sprouting stems is typically necessary on a proportion of the plants treated.
 - b. <u>Hack and Squirt</u>: Herbicide is applied directly to living tissue in woody species by partially cutting or drilling into a trunk or branch and painting or dripping herbicide on exposed cambium. This method may be used when cutting stems is not possible or when it may be desirable to leave standing dead vegetation in place.
 - c. <u>Wick/Wipe/Drip</u>: Herbicide is applied by hand to foliage of individual plants with a brush or sponge, or dripped with a squeeze bottle. This method is primarily used for control of small infestations or portions of infestations where spray application is restricted (such as close to water or sensitive plants).
- 2. <u>Directed Foliar/Drizzle/Basal Bark Spray</u>: Herbicide is applied to green foliage of individual plants or the lower portion of the trunk of woody species (basal bark) with backpack sprayers or truckmounted hose sprayers. This method uses a hand-operated spray wand with a regulator nozzle to control application of herbicide to target plants while minimizing spray between target plants.

- 3. <u>Spot Spray</u>: Herbicide with residual soil activity is applied to the target invasive plant and adjacent soil using a backpack sprayer to provide pre-emergent control of re-sprouts and seedlings. This method would be limited to sites with high percent cover of invasive plants and requires incorporation by rainfall to reach the root zone of the target species.
- 4. <u>Broadcast Foliar Spray</u>: Herbicide is applied using a boom sprayer that is either hand-held or mounted on an ATV or vehicle. This method is only used for dense infestations where invasive plant cover is very high and risks to other resources are minimal.

Most herbicide applications are more effective when combined with adjuvants (solution additives), such as surfactants and marker dye. Surfactants enhance activity of an herbicide's active ingredient by facilitating and enhancing the absorbing, emulsifying, dispersing, spreading, sticking, wetting, or penetrating properties of the herbicide. Marker dyes are used to visually confirm the location of the herbicide application; this assists the applicator in limiting the application to the target plants and reduces risk of application to non-target areas. This project will use a methylated seed oil (MSO) type surfactant and a water-soluble dye.

Biological Control

Biological control agents are available for some of the invasive species known on the Inyo NF (see Table 2 in the Project EA). This method involves release of natural enemies such as parasitoids, predatory insects, pathogens, or antagonists to suppress pest populations. The US Department of Agriculture, Agricultural Plant Health and Insect Services (APHIS) is the lead agency for biocontrol activities in the US, and is required to complete NEPA analysis and documentation before allowing the use of a specific biological control agent. Use of this method would comply with the APHIS NEPA document and decision, would be conducted in coordination with the appropriate federal, state, and/or county agencies, and would be reviewed during the project Annual Implementation Process.

3.1.4 Revegetation

Revegetation of gaps in vegetation or bare areas created by invasive plant treatments is a critical component of an integrated invasive plant management strategy. In some cases, re-colonization from the existing seedbank and propagules may be sufficient; in other situations active restoration may be needed to provide competition with highly aggressive species. Revegetation of bare areas created by invasive plant treatments, particularly with perennial grass species, may suppress re-growth of invasive species. Site restoration and revegetation may be helpful in preventing re-infestation by the invasive plant that has been treated, or a new infestation by another invasive species. Revegetation will be implemented by spreading native seed, or by planting native plants, either as bare root stock or potted plants. Non-native species would not be used. Revegetation may include mulching with native litter or duff, or certified weed-free straw, raking to establish the seed bed, and treatment of invasive plants, as required, using the methods proposed above.

3.1.5 Monitoring

The Forest will continue to inventory invasive plant infestations and monitor treatment efficacy and will use this information to evaluate and direct eradication and control activities. Treatment effectiveness will be monitored each year using standard procedures described in the National Data Recording Protocols for Invasive Species Management. Monitoring would typically continue at treated sites for at least three years with no plants found prior to determining the target species has been eradicated.

3.1.6 Early Detection Rapid Response

The Early Detection Rapid Response (EDRR) approach is an essential component of the Invasive Plant Management Strategy and, coupled with prevention guidelines and an annually-updated inventory, will allow the Inyo NF to maintain a greater portion of the forest in an invasive plant-free condition. Under the EDRR approach, new or previously undiscovered species or infestations would be treated using the range of methods described in this Proposed Action and in accordance with the Project Design Features. EDRR treatments would be reviewed each year following the Annual Implementation Process or occasionally during the field season (following the same review process) if a high-priority infestation requiring immediate treatment is detected.

3.1.7 Annual Implementation Process

The Annual Implementation Process, led by the Forest Invasive Species Coordinator, would allow resource specialists to review planned treatment methods and maps of the specific sites proposed for treatment each year, including all newly identified infestations (EDRR) and expansions of existing infestations. The Annual Implementation Process would include a review and documentation of proposed site-specific treatment methods and applicable project Design Features for implementation.

3.2 PROJECT SPECIFIC DESIGN CRITERIA

The following project-specific Design Criteria either minimize or avoid adverse effects to resources. The design criteria included here are those that have the potential to affect botanical resources. For the complete list of project design criteria, refer to the Invasive Plants Treatment Project Draft Environmental Assessment.

3.2.1 Standard Treatment Procedures

- Herbicides will be applied by trained and/or certified applicators in accordance with label directions and applicable federal and state pesticide laws, except where the following design features describe more restrictive measures.
- 2. Weather conditions (wind speed and direction, probability of precipitation, temperature, temperature inversions, atmospheric stability, and humidity) will be carefully monitored before and during herbicide applications to minimize drift, volatilization, and leaching or surface runoff of herbicides, based on label instructions.
- 3. Prior to the start of spray applications, all spray equipment will be calibrated to ensure accuracy of delivered amounts of herbicide. Equipment will be regularly inspected during herbicide applications to ensure it is in proper working order.
- 4. Herbicide spray applications will not occur when wind speeds exceed label restrictions. Use best professional judgment and consider application-specific factors (e.g. pesticide and adjuvant properties; application equipment, height, pattern and technique; target vegetation density, size, and acreage; proximity to sensitive resources; temperature and humidity; and wind speed and direction) to ensure spray applications do not result in unacceptable drift. Prior to beginning spray applications, applicators will be provided with information on local terrain and wind patterns and how they affect spray drift.

- 5. Herbicide application will be carefully evaluated following precipitation and/or when runoff, soil saturation, standing water, or heavy dew is present or expected, to ensure the application will not result in herbicides entering surface or groundwater. Application will occur only under favorable weather conditions, generally defined as: 30% or less chance of precipitation on the day of application based upon NOAA forecasting, rain does not appear likely at the time of application, and if rain is predicted within 48 hours, the amount does not exceed a ¼ inch.
- 6. Preparation of herbicides for application, including mixing, filling of wands and rinsing of equipment, will take place outside of Riparian Conservation Areas and other sensitive sites. Herbicide preparation will occur only on level, disturbed sites.
- 7. A spill cleanup kit will be readily available whenever herbicides are transported or stored. Proper Personal Protective Equipment (PPE) would be worn or carried by the applicator at all times when using herbicides.
- 8. Streams or other surface waters will not be used for washing herbicide application equipment or personnel, unless required in an emergency situation.
- 9. Low nozzle pressure (<25 PSI) and a coarse spray producing median droplet diameter of >500 microns will be used in order to minimize drift during herbicide applications.
- 10. The herbicide spray nozzle will be kept as close as possible (within 20 inches) to target vegetation to limit overspray and drift to non-target vegetation.
- 11. When invasive plants are manually removed, methods that prevent seed spread or resprouting will be used. If flowers or seeds are present, the plant will be pulled carefully to prevent seeds from falling and will be placed in an appropriate container for disposal. If no flowers or seed heads are present the invasive plant may be pulled and placed on the ground to dry out.
- 12. Equipment, vehicles, clothing, and personal items will be inspected and cleaned as necessary to ensure they are free of soil, seeds, vegetative matter or other debris prior to entering new treatment areas or moving from one infestation to another.

3.2.2 Botanical Resources

- 29. During the Annual Implementation Process, the Forest Botanist will review treatment sites that are within 500 feet of TES plant occurrences. The treatment method(s) shall be designed to avoid impacts to TES plants. Herbicide spray applications would not occur within 50 feet of TES plant occurrences unless reviewed and approved by the Forest Botanist.
- 30. Where treatments occur within or directly adjacent to TES plant occurrences, a Botanist will instruct workers in the proper identification of TES plant species to ensure that individual plants are avoided/protected. Populations will be flagged for avoidance as needed.

- 31. Where determined necessary based on habitat suitability, surveys will be conducted for TES plant species in the vicinity of treatment areas prior to treatment.
- 32. If treatments occur within and adjacent to TES plant occurrences, the forest will implement monitoring designed to detect positive and negative impacts to TES plant occurrences. These results will be reported for the TES plant occurrence in the appropriate national database (e.g. NRIS).

3.2.3 Soil and Water Resources

- 33. Herbicide application will not occur within the buffers for aquatic features shown in Table 3.
- 34. Areas of bare soil created by the treatment of invasive plants will be evaluated for restoration and revegetation by a Botanist and Soil Scientist or Watershed Specialist. Restoration measures, such as native plantings, seeding, or application of weed-free ground cover, will be implemented as needed.
- 35. State and Regional Water Quality Control Board certified Best Management Practices will be implemented (Appendix C). BMPs applied to all Forest projects are outlined in the Water Quality Management for Forest System Lands in California, BMP handbook and the National Core BMP Technical Guide (USDA Forest Service, 2012).
- 36. Mixing or application of herbicides will not occur within 100 feet of a well or spring used as a domestic water source. Applicators will be briefed about the locations of domestic water sources prior to beginning work and buffers will be flagged on the ground.
- 37. During the Annual Implementation Process, the Forest Watershed Specialist will review the treatment sites to determine if they occur on soils with low permeability. Broadcast and spot spray of aminopyralid and clopyralid would not occur on low permeability soils.
- 38. Hand pulling or wrenching of invasive plants along streambanks or natural lake or pond shorelines will not exceed 20 percent of the stream reach or 20 percent of the shoreline.

Table 1. Minimum buffers¹ for herbicide application near aquatic features.

		Live Water Prese	nt²	N	Dry Wash/ Ephemeral ⁴			
Herbicide (Active Ingredient)	Broadcast Direct Foliar/ Spray Spot Spray		Hand Application	Broadcast Spray	Direct Foliar/ Spot Spray	Hand Application	Direct Foliar/ Hand Application	
Aminopyralid	50	25	10	50	10	10	channel edge	
Chlorsulfuron	50	25	water's edge	50	25	channel edge	no buffer	
Clethodim	50	25	10	50	25	10	no buffer	
Clopyralid	50	50	10	50	25	10	channel edge	
Fluazifop-P-Butyl	50	25	10	25	25	10	no buffer	
Glyphosate*	25	water's edge	water's edge	25	channel edge	channel edge	no buffer	
lmazapyr*	50	25	water's edge	50	10	channel edge	no buffer	
Triclopyr-TEA*	50	25	water's edge	50	10	channel edge	no buffer	

Triclopyr-BEE	50	25	10	50	10	10	no buffer

¹ Buffers are relatively level vegetated areas- not hardscapes such as pavement.

3.3 No Action (Alternative 2)

Under the No Action alternative there would be no change to the level and types of activities currently being implemented for the control or eradication of invasive plant infestations on the Inyo NF. Invasive plant treatments allowed under three existing NEPA decisions (2007 Weed Eradication and Control Project; 2010 Perennial Pepperweed Eradication Project; 2017 Bassia Control Project) would continue to occur but no new or comprehensive efforts would be implemented.

4 EFFECTS ANALYSIS METHODOLOGY

4.1 GEOGRAPHIC AREA EVALUATED

The project area encompasses approximately 2 million acres including all federal lands managed or administered by the Inyo National Forest in California and Nevada, which will serve as the geographic bounds for effects analysis of sensitive plants. The project area is an appropriate size to assess the effects of the proposed activities because all potential disturbances and effects to sensitive plants would occur within this boundary. Any predictable effects to vegetation would remain within this area. For sensitive plants, the project area also serves as the area of analysis for cumulative effects because effects of other past, present, and foreseeable activities would interact with effects of the proposed project only within the project area.

4.2 ANALYSIS TIMEFRAME

Short-term effects generally coincide with the life of project activities (0-7 years). Long-term effects extend beyond this timeframe (7-20+ years).

4.3 Species Considered

4.3.1 Endangered Species Act

There are no federally endangered or threatened plant species known to occur or with known suitable habitat on the INF. There is one candidate species known to occur on the INF— whitebark pine.

4.3.2 R5 Regional Forester's Sensitive Species List

The Regional Forester identifies species for which population viability is a concern because of (1) downward population trends and/or (2) diminished habitat capacity that would reduce species distribution (FSM 2672.11, USDA 2005). The R5 Sensitive list was last revised in July 2013 (USDA 2013). All Forest Service Region 5 Sensitive plant species that are known or have suitable habitat on the INF were considered.

² Perennial and intermittent streams with water present, ponds, lakes, springs, seeps, seasonal wetlands, and wet meadows

³ Seasonally flowing or intermittent channels that support riparian-dependent vegetation but no water is currently present; dry seasonal wetlands and meadows.

⁴ Dry washes and ephemeral channels that do not support riparian-dependent vegetation.

^{*} Aquatic formulation would be used within 25 feet of live water.

4.3.3 Species considered for the project

Those species known to occur or with suitable habitat within the analysis area are considered to have potential to be impacted by the proposed project activities. Because the project area is forest-wide, all species on the INF Sensitive Species List were considered (Table 2).

Table 2. Threatened, endangered, and sensitive plants (TESP) known to occur or with suitable habitat on the INF.

		Known	Number of INF	TEST / Known to occur of with suitable habitat on
Sensitive Species	Status ¹	on INF	Pop'ns	Suitable Habitat
Abronia alpina	S	Yes	1	Special Habitat (Dry Forb), Subalpine
Abronia nana ssp.				Special Habitat (Carbonate), Sagebrush,
covillei	S	Yes	9	Pinyon-Juniper, Subalpine
Astragalus cimae var.				
sufflatus	S	Yes	1	Pinyon-Juniper
Astragalus johannis-		.,		6
howellii	S	Yes	2	Special Habitat (Alkali Flat), Sagebrush
Astragalus lemmonii	S	Yes	3	Special Habitat (Alkali Flat), Sagebrush
Astragalus				Special Habitat (Dry Forb) Lodgenole
lentiginosus var. kernensis	S	Yes	30	Special Habitat (Dry Forb), Lodgepole, Subalpine
Kerrierisis		103	30	Special Habitat (Dry Forb, Pumice Flats),
Astragalus monoensis	S	Yes	27	Sagebrush, Jeffrey Pine
Astragalus ravenii	S	Yes	3	Alpine
Boechera bodiensis	S	Yes	3	Mountain Mahogany, Pinyon-Juniper
Boechera evadens	S	No	0	Sagebrush
Boechera pinzliae	S	Yes	8	Subalpine
Boechera shockleyi	S	Yes	8	Xeric Shrub/Blackbrush
Boechera tiehmii	S	Yes	11	Alpine
Boechera tularensis	S	Yes	9	Subalpine, Meadow, Riparian
Botrychium				
ascendens	S	Yes	3	Subalpine, Meadow, Riparian
Botrychium		Vaa	0	Cubalnina Mandaus Binavian
crenulatum	S	Yes	9	Subalpine, Meadow, Riparian
Botrychium lineare	S	Yes	1	Subalpine, Meadow, Riparian
Botrychium lunaria	S	Yes	2	Subalpine, Meadow, Riparian
Botrychium		V	2	Cultural Mandau Binarian
minganense Botrychium	S	Yes	2	Subalpine, Meadow, Riparian
paradoxum	S	No	0	Subalpine, Meadow, Riparian
Botrychium tunux	S	No	0	Subalpine, Meadow, Riparian
Botrychium		140		Sacarpine, meddow, mpunun
yaaxudakeit	S	No	0	Subalpine, Meadow, Riparian
Bruchia bolanderi	S	Yes	2	Subalpine, Meadow
Calochortus				
excavatus	S	Yes	4	Xeric Shrub/Blackbrush, Sagebrush, Meadow
Calyptridium				
pygmaeum	S	Yes	3	Subalpine, Alpine

		Known	Number of INF	
Sensitive Species	Status ¹	on INF	Pop'ns	Suitable Habitat
Carex tiogana	S	Yes	3	Alpine
Cladium californicum	S	No	0	Special Habitat (Alkali), Meadow, Riparian
Cordylanthus				
eremicus ssp.				
kernensis	S	Yes	3	Subalpine, Alpine
Cryptantha incana	S	Yes	10	Lodgepole, Red Fir
Dedeckera eurekensis	S	Yes	13	Special Habitat (Carbonate), Xeric Shrub/Blackbrush
Draba asterophora				
var. asterophora	S	No	0	Subalpine, Alpine
Draba cruciata	S	No	0	Subalpine
Draba incrassata	S	No	0	Alpine
Draba monoensis	S	Yes	4	Alpine
Draba sharsmithii	S	Yes	4	Alpine
Ericameria gilmanii	S	Yes	1	Pinyon-Juniper, Subalpine
Erigeron aequifolius	S	Yes	1	Mixed conifer
	S		1	
Erigeron multiceps Erigeron uncialis var.	3	Yes	1	Meadow, Riparian, Lodgepole, Aspen
uncialis	S	Yes	2	Special Habitat (Carbonate), Sagebrush
Eriogonum wrightii				
var. olanchense	S	Yes	3	Subalpine, Alpine
Greeneocharis				
(Cryptantha)				
circumscissa var.		V	4	Consider the Mark (Down French) Control to a Marine
rosulata	S	Yes	1	Special Habitat (Dry Forb), Subalpine, Alpine
Helodium blandowii	S	Yes	2	Subalpine, Meadow
Hesperidanthus jaegeri	S	Yes	1	Special Habitat (Carbonate), Pinyon-Juniper, Subalpine
				·
Horkelia hispidula	S	Yes	12	Sagebrush
Hulsea brevifolia	S	Yes	3	Mixed conifer, Red Fir, Lodgepole, Subalpine
Hulsea vestita ssp.	S	Voc	2	Sagabrush Dinyan luninar
pygmaea	3	Yes	3	Sagebrush, Pinyon-Juniper Special Habitat (Pumice Flat, Dry Forb)
Lupinus duranii	S	Yes	48	Sagebrush, Jeffrey Pine
Lupinus lepidus var.		1.03	70	and any active in the
culbertsonii	S	No	0	Meadow, Riparian, Lodgepole, Red Fir
Lupinus padre-				
crowleyi	S	Yes	13	Sagebrush, Jeffrey Pine
Meesia uliginosa	S	No	0	Meadow, Riparian
Mentzelia inyoensis	S	Yes	1	Sagebrush, Pinyon-Juniper
Monardella beneolens	S	Yes	3	Subalpine, Alpine
Oreocarya				
(Cryptantha)				
roosiorum	S	Yes	7	Subalpine

		Known	Number of INF	
Sensitive Species	Status ¹	on INF	Pop'ns	Suitable Habitat
Peltigera gowardii	S	Yes	1	Riparian
Petrophytum caespitosum ssp.				
acuminatum	S	Yes	1	Mountain Mahogany, Pinyon-Juniper, Alpine
Phacelia inyoensis	S	Yes	5	Sagebrush
Phacelia monoensis	S	Yes	10	Pinyon-Juniper
Phacelia novenmillensis	S	No	0	Pinyon-Juniper, Jeffrey Pine
Pinus albicaulis	C, S	Yes	38	Lodgepole, Subalpine
Plagiobothrys parishii	S	Yes	1	Xeric Shrub/Blackbrush
Polemonium chartaceum	S	Yes	8	Alpine
Polyctenium williamsiae	S	Yes	4	Sagebrush
Potentilla morefieldii	S	Yes	11	Alpine
Senecio pattersonensis	S	Yes	1	Alpine
Streptanthus gracilis	S	Yes	3	Subalpine, Alpine
Streptanthus oliganthus	S	Yes	4	Pinyon-Juniper
Trifolium dedeckerae	S	Yes	10	Sagebrush, Subalpine, Alpine

¹C = Federally Listed as Candidate; S = Forest Service Sensitive

4.4 ANALYSIS METHODOLOGY

The effects analysis was completed by quantifying the extent to which known invasive plant infestations overlap with known sensitive plant occurrences, followed by evaluating the various direct and indirect effects that could occur to occurrences and suitable habitat. Project design features were reviewed to understand how they would minimize the risk of direct and indirect effects. Field reconnaissance surveys were not conducted specifically for the planning phase of this project, as all current survey and monitoring data from forest projects and programs is relevant to this analysis. In addition, there is opportunity to survey prior to any treatment activity as outlined in the design criteria (#31) and the annual implementation process.

The effects analysis assumes that Priority 1 and 2 species will comprise the majority of treatment efforts over the life of the project, while Priority 3 and 4 species will be treated on an infrequent basis. It is assumed that when Priority 3 or 4 species are targeted for treatment, there will be an extraordinary benefit or high likelihood of success at that site, as identified through the Annual Implementation Process. Therefore the spatial analysis of existing occurrences and infestations focuses on Priority 1 and 2 invasive species.

5 Existing Condition

5.1 PLANT COMMUNITIES AND HABITATS

The Invasive Plants Treatment Project Area spans the entire Inyo NF. Situated at the intersection of California's three major floristic provinces-California Floristic Province, Great Basin, and Desert- the flora of the INF is notably diverse. The area's complex geology, topography, and climate have resulted in an exceptionally high level of endemism relative to other regions of the United States.

The High Sierra Nevada region is topographically complex, with vegetation dominated by mixed conifer, Jeffrey pine, red fir, lodgepole pine, mountain hemlock, whitebark pine, foxtail pine, or western white pine. Treeless alpine areas, meadows, and riparian areas are also common. In the Eastern Sierra Nevada region, the elevation gradient is abrupt, creating rapid transitions from desert and sagebrush vegetation at the lowest elevations, to pinyon-juniper woodlands, conifer forests, and alpine areas. The White and Inyo Mountains region is situated in the rain shadow of the Sierra Nevada, and receives less precipitation, as evident in the arid-adapted vegetation, including pinyon-juniper, mountain mahogany, sagebrush, bristlecone and limber pine, and alpine areas.

Approximately half of the Inyo NF is designated as wilderness, which encompasses much of the higher elevation habitat in the Sierra Nevada and White and Inyo Mountains. These habitats are generally relatively undisturbed with the exception of wildfires and non-motorized recreation. The lower-elevation habitats (e.g. desert scrub, sagebrush, pinyon-juniper, and conifer forests) which occur in the front-country portions of the forest, are where much of the ground-disturbing activities occur, such as roads and trails, vegetation management, developed recreation, utility infrastructure, and interface with urban areas and other land ownerships.

5.2 Known Invasive Plant Species

Currently, 58 non-native invasive plant species are known to occur on the forest, and approximately 45,846 gross infested acres are mapped (Appendix A of the Draft EA), with infestations ranging from a single plant to areas over 5,000 acres in size. Thirteen species totaling approximately 58 gross acres are identified as Priority 1 with the goal of eradication. An additional eight species totaling approximately 1,432 gross acres are identified as Priority 2 with the goal of control (most of this acreage is from just two species- saltlover and tamarisk). Fourteen species totaling ~40,000 acres are identified as Priority 3 with the goal of containment. The vast majority of this acreage is from the annual grasses cheatgrass and red brome. An additional 23 species totaling nearly 4,200 acres are identified as Priority 4, with very limited or no treatment proposed at this time. Priority 3 and 4 species are not always mapped as they are either prolific on the forest or have a low environmental impact rating by CDFA and/or Cal-IPC; therefore it is likely that actual acres infested is higher for many of them.

5.3 Sensitive Species Known in the Vicinity of High Priority Infestations

Currently, six sensitive plant species with seven occurrences are located within 500 feet of known high-priority infestations (Priority 1 & 2) for treatment (Table 3). These species include annual herbs (*Phacelia inyoensis* and *Phacelia monoensis*), perennial herbs (*Boechera shockleyi, Calochortus excavatus*, and *Erigeron multiceps*), and a tree (*Pinus albicaulis*). All of these species have multiple occurrences on the INF, with the exception of *E. multiceps*, which only occurs at one 3-acre population on the INF. In addition, all these species have occurrences outside the INF.

Table 3. Known sensitive plants in the vicinity (<500 ft) of high priority infestations and likely proposed treatment methods.

	Common				Distance	
Species	Name	Site ID	Location	Infestation	(ft)	Proposed Treatment

Phacelia inyoensis	Inyo phacelia Mono	PHIN-005	McMurry Meadow	whitetop (CAPU-005)	DIFU-175 CAPU-10	Teasel-Hand pull and/or direct foliar; Whitetop-direct foliar
Di contin				teasel (DIFU-001)	DIEU 475	Tourist and a first first
Erigeron multiceps	Kern River daisy	ERMU-001	South Fork Kern River	tamarisk (TARA-050)	0	Hand-pulled in 2015; follow-up survey for additional plants, possible additional hand-pull or cut-stump
Calochortus excavatus	Inyo County star-tulip	CAEX-002	Fuller Creek	teasel (DIFU-001)	10	Hand pull and/or direct foliar
Calochortus excavatus	Inyo County star-tulip	CAEX-001	McMurry Meadow	teasel (DIFU- 001)	430	Hand pull and/or direct foliar
Boechera shockleyi	Shockley's rockcress	BOSH-008	Sam's Spring	tamarisk (TARA-004)	0	Cut-stump in 2008, 2009, 2011, 2014, 2015; follow-up survey for re-sprouts and additional plants, possible additional cut-stump

6 EFFECTS OF THE PROPOSED PROJECT

6.1 ALTERNATIVE 1 (PROPOSED ACTION)

The Proposed Action includes manual, mechanical, cultural, chemical and biological methods to treat non-native invasive plant species across the forest with follow-up effectiveness monitoring. Revegetation measures would be conducted as needed. Proposed treatments would be developed collaboratively and reviewed annually by an Interdisciplinary Team.

Many invasive plants compete with sensitive species and can reduce their abundance. Invasive plants can also indirectly affect sensitive species by degrading their habitat through the alteration of fire or nutrient regimes. Biodiversity of native plant communities is reduced by invasive species that form dense monocultures. Once invasive species become established they can be difficult to eradicate, requiring time and resources, often over multiple years, for successful treatment. While invasive plant treatment could cause some negative impacts to individual sensitive plants in the short-term, this project is expected to have beneficial effects on sensitive plants, their habitat, and native vegetation in the long-term as the impacts from the persistence and spread of invasive plants is controlled.

6.1.1 Direct & Indirect Effects

Direct effects involve physical damage to plants or their habitat. Manual and cultural treatments have the potential to directly affect plant species, resulting in death, altered growth, or reduced

seed set through physically breaking, crushing, burning, scorching, or uprooting plants. Herbicides, formulated to kill plants, have the potential to injure or kill plant species upon contact, depending upon the selectivity of the herbicide, timing of the application, and sensitivity of the plant species. Direct effects of herbicides vary according to the chemical composition and application rate of the herbicide and are discussed in detail below.

Indirect effects are separate from an action in either time or space. These effects, which can be beneficial or detrimental to rare species, may include changes in plant community composition once invasive plant species are removed, or the indirect effects of herbicide application, such as off-target drift, surface runoff, or leaching. Invasive plant treatments are completed with the intention of altering plant community composition by decreasing invasive plant cover and increasing the habitat available to other plant species, including rare plants. Indirect beneficial effects are one of the primary goals of the control and eradication of invasive plants when they occur in suitable habitat for rare plants or in close proximity to existing occurrences of rare plants, and for native vegetation community composition.

Manual and Mechanical Treatments

Manual and mechanical methods for removing invasive species can be effective and are highly selective but there is a small risk of workers inadvertently trampling, uprooting, or otherwise disturbing non-target vegetation including sensitive species growing intermixed with invasive species. If a significant amount of invasive plant vegetative material is left on site (such as piled tamarisk cuttings), non-target vegetation or sensitive plants could also be buried or shaded by it. When using a string trimmer or mower there is some risk of impacting non-target vegetation intermixed with the target invasive species. Incidental trampling is also a possibility during implementation of cultural and herbicide treatment methods as workers move through the treatment area. However, the direct effects of these methods would be restricted to the area of treatment and the immediate surrounding area that may experience foot or equipment traffic during implementation.

To avoid potential impacts, all invasive plant treatments within 500 feet of known occurrences will be designed and overseen by a Forest Service Botanist (DF #29). In addition, workers would be trained in the identification of sensitive plant species, further minimizing the potential for direct effects from these treatments (DF #30). Where invasive species occur within suitable habitat for sensitive plants, surveys would be conducted prior to treatment (DF #31), and where treatments occur adjacent to or within sensitive plant occurrences, follow-up monitoring would be conducted and treatments adjusted as needed (DF #32). These design features would minimize or remove the risk of direct effects to sensitive species from manual and mechanical treatments.

Hand-pulling is likely to be used to treat infestations or portions thereof in the vicinity of sensitive plant occurrences BOSH-008, CAEX-001, CAEX-002, ERMU-001, PHIN-005, and PHMO-11 (Table 3), in order to minimize potential direct effects from less selective treatment methods. There is some potential for impacts to individuals from incidental trampling, however workers will be instructed in plant identification, and the target invasive species are easily identifiable and differ in appearance compared to the sensitive plant species. Therefore it is expected that negative effects, if any, will be minimal, short-term, and limited to a few individuals.

Cultural Treatments

Tarping and mulching may cause localized effects to non-target native vegetation that is inter-mixed with invasive species because the method is not selective or targeted in the area where applied. However, the direct effect would be precisely restricted to the footprint in which the method was

applied. It is unlikely that either tarping or mulching would be selected in areas where invasive plants were intermixed with sensitive plants, which would eliminate the potential for direct effects (DF #29, 31).

Flaming using a hand-held propane torch or using a hand-held light wand would be more selective than tarping or mulching but could still impact individual plants or non-target vegetation, depending on the density of vegetation at the treatment site. This method would have no ground disturbance and would also be directly limited to the footprint where applied. This method is not likely to be used extensively and would likely not be selected if infestations were inter-mixed with sensitive plants (DF #29, 31).

Currently there are no infestations in the vicinity of known sensitive plant sites where any cultural treatment method is proposed.

Herbicide Application

Potential effects from herbicide application to non-target vegetation, including sensitive plants, can occur in four ways: 1) direct exposure (direct spraying or over spraying) 2) off-target drift 3) movement of chemicals by leaching, runoff, or on soil and 4) accidental spills. The effects of these four scenarios are described further below.

Direct exposure: Effects from direct exposure are dependent on a combination of factors including the non-target native plant species, the timing and method of application, and the selectivity of the herbicide being applied. The risk of direct exposure would also be dependent on the applicator's knowledge of non-target vegetation to be avoided (sensitive species, riparian vegetation, desirable native species, etc). For all herbicide applications, potential for direct exposure will generally be limited to those plants in the immediate vicinity (within ~5 feet) of targeted vegetation. Broadcast, spot, directed foliar, and drizzle spray methods have the greatest risk for direct exposure to non-target vegetation from overspray. Broadcast spray is the least selective spray method as all vegetation is covered with herbicide in the area where herbicide is applied. However this method would be reserved for areas with dense infestations where no sensitive plants are present. Wicking, wiping, and dripping are expected to have the least potential for direct exposure to non-target vegetation since herbicides are directly applied onto the target vegetation by hand and there is no risk of overspray.

While all herbicide applications have some risk of direct exposure to surrounding non-target vegetation, the proposed action has been designed to reduce effects to non-target vegetation by always favoring the most selective/targeted treatment available that is effective and feasible. When broadcast or spot applications are selected, vegetation cover would be dominated by invasive species. Selective application methods (direct foliar, cut-stump, and wiping/dripping) would be the method used for the majority of infestations identified for herbicide treatment, so widespread effects to non-target vegetation from direct exposure are not expected under the proposed action.

For sensitive species, spray applications would be avoided within 100 or 50 feet of sensitive plant populations (DF #29). This would effectively negate the chance of any accidental direct spray or over spray. Under EDRR the Forest Botanist would design treatments to effectively remove invasive species without adversely impacting the sensitive plant occurrences and to also ensure that sites are properly protected (i.e. flagged on the ground) when invasive plant treatments are conducted (DF #29, 30, 31). Additional techniques, such as timing application after annuals are senesced or prior to perennials emerging, using protective barriers, or using selective herbicides, can also be used to minimize potential for direct impacts to sensitive and non-target plant species.

Off-target drift: When using spray application methods (boom and backpack) there is some potential for effects from herbicide drift down-wind of the application area. These effects can range from reduced plant vigor, abnormal growth, or necrosis to death, depending on both the exposure (dose) and the herbicide-sensitivity of the affected plant species. Herbicide drift is influenced by a number of factors including site topography and surrounding vegetation; spray droplet size; wind speed and direction; and height of spray nozzle.

Project design features have been included for all herbicide spray applications to reduce the potential of off-target drift including: 1) use of coarse droplet size thereby limiting the presence of driftable droplets (DF #9), 2) restrictions on the maximum distance of spray nozzle from the target vegetation (DF #10) and 3) restriction on wind-speed and direction when applying herbicides (DF #4). Additional design features excluding herbicide spray applications near streams and other special aquatic features (DF #33) would further reduce the risk of off-target effects from herbicide drift to riparian vegetation, meadows, and sensitive species that occur in these habitat types. The proposed action also includes further limitations on the use of herbicide spray application within 100 and 50 feet of sensitive plant species for boom and backpack application, respectively (DF #29).

Analysis of off-target drift uses SERA risk characterization models for each herbicide to provide an estimate of the maximum projected risk to non-target plant species. Because herbicide drift is influenced by a number of factors, drift estimates are intended to be used as estimates (SERA 2014). Risk is characterized using hazard quotient (HQ) values, with HQ >1 indicating a potential for drift impacts. Model assumptions include boom application using a fine droplet spray at 20 inches above the target vegetation, and wind speeds of 10 mph, and report hazard quotients for no observable effect concentration (NOEC) thresholds. It is important to note that these model assumptions are substantially different from most of the applications proposed in this project; however these model results are utilized to provide a general assessment of the relative risks to non-target plants from application of each herbicide. For some herbicides, there are now estimates of drift risk for backpack sprayers; however, the HQ values reported for backpack applications are just the 50th percentile results from the boom model, as opposed to the 90th percentile results from the boom model for boom applications.

Modeled hazard quotients for both herbicide-sensitive and herbicide-tolerant vascular plant species were reviewed for spray drift from application of proposed herbicides (SERA risk assessments and worksheets) (Table 4). The distances where herbicide spray applications would be restricted were set by reviewing HQs at the range of modeled distances and selecting a distance where the HQ was less than one for herbicide-tolerant species and approached a value of one for herbicide-sensitive species. Using this method, at a distance of 100 feet from broadcast applications, the HQ is less than 1 for herbicidetolerant species for all herbicides but is greater than 1 for herbicide-sensitive species for all herbicides except Clethodim and Fluazifop. HQs for backpack application are available for Clethodim, Fluazifop, glyphosate, Imazapyr, and Triclopyr; at a distance of 50 feet from backpack applications of these herbicides, the HQ is less than 1 for herbicide-tolerant species for all herbicides but is greater than 1 for herbicide-sensitive species for all herbicides except Clethodim and Fluazifop. While the modeled HQs at the selected buffer distances of 100 feet and 50 feet exceed a value of one for many of the proposed herbicides, actual impacts to sensitive plants are expected to be much less for the following reasons. The drift scenario (model inputs) used for this analysis exceed a number of restrictions included in the proposed action to limit drift, so the actual drift expected from spray applications are expected to be lower than the modeled hazards in the SERA Risk Assessments. Based on the inclusion of a number of project design features that are proven (Marer 2000) to reduce the risk of offsite affects from drift (wind restrictions, course droplet size, low nozzle height), it is reasonable to conclude that adverse effects to herbicide-sensitive species from drift are unlikely from this project when treating invasive species outside the buffer distances for sensitive plants (DF #29). The drift models used in the SERA risk assessment are based on broadcast boom applications in an agricultural setting which is expected to exceed the actual drift observed from backpack applications in a forested area (SERA 2011), although the extent of this reduction cannot be quantified. When treatments are made via directed foliar applications using backpack sprayers, the hazard quotients should be less than those modeled for boom application. For herbicide-sensitive species, the nature of effects from offsite drift will also depend on the application rate and site-specific conditions such as topography, vegetation cover, and weather. The stated risk from drift is also contrary to observations from past invasive plant herbicide applications on national forest lands which have occurred without observed effects to adjacent vegetation or sensitive species aside from those immediately neighboring the target plant. Based on direct experience from herbicide applications on NFS lands, the inclusion of design features to limit drift (Marer 2000) (e.g. course droplet size, wind restrictions, low nozzle height), and implementation of 100 feet and 50 feet herbicide-spray exclusion zone, the risk to Sensitive plants from herbicide drift is expected to be low. Buffers created around aquatic features such as meadows, fens, and along riparian corridors will also serve to protect riparian vegetation and sensitive species habitat within riparian zones.

Table 4. Hazard quotients¹ for effects to terrestrial plants from herbicide spray drift from SERA Risk Assessments and Worksheets. Numerical values shown are for herbicide-sensitive species with the value for herbicide-tolerant species shown in parentheses. Application rates are those analyzed in SERA Risk Assessments, which consider likely USFS application methods and label recommended and maximum rates.

Distance from	Aminopyralid*	Chlorsulfuron*	Clethodim	Clethodim	Clopyralid*	Fluazifop-P-	Fluazifop-P-	Glyphosate	Glyphosate	Imazapyr	Imazapyr	Triclopyr	Triclopyr
Application	(0.11 lb/ac)	(0.12 lb/ac)	(0.25 lb/ac)	(0.25 lb/ac)	(0.25 lb/ac)	Butyl	Butyl	(3 lb/ac)	(3 lb/ac)	(1 lb/acre)	(1 lb/acre)	(1.5 lb/ac)	(1.5 lb/ac)
Site (ft)	low boom	low boom	low boom	backpack	low boom	(0.375 lb/ac)	(0.375 lb/ac)	low boom	backpack	low boom	backpack	low boom	backpack
						low boom	backpack						
0	550 (1)	13,636 (0.9)	109 (1)	109 (1)	500 (0.5)	46 (0.6)	46 (0.6)	2,308 (7)	2,308 (7)	15,625 (0)	15, 625 (3)	536 (0.8)	536 (0.8)
25	10 (0)	255 (0)	4 (0)	0.9 (0)	9 (0)	1.6 (0)	0.4(0)	81 (0)	19 (0)	547 (0)	130 (0)	19 (0)	4 (0)
50	6 (0)	138 (0)	1.9(0)	0.5 (0)	5 (0)	0.8 (0)	0.2 (0)	41 (0)	10 (0)	277 (0)	68 (0)	9 (0)	2 (0)
100	3 (0)	79 (0)	1(0)	0.3 (0)	3 (0)	0.4(0)	0.1(0)	22 (0)	5.6 (0)	148 (0)	38 (0)	5 (0)	1.3 (0)
300	1.3 (0)	33 (0)	0.4(0)	0.1 (0)	1.2 (0)	0.2 (0)	0 (0)	8 (0)	2.2 (0)	55 (0)	15 (0)	1.9 (0)	0.5 (0)
500	0.8 (0)	20 (0)	0.2 (0)	0 (0)	0.8 (0)	0 (0)	0 (0)	4.8 (0)	1.3 (0)	33 (0)	9 (0)	1.1(0)	0.3 (0)
900	0.4(0)	11 (0)	0.1(0)	0 (0)	0.4(0)	0 (0)	0 (0)	2.5 (0)	0.7 (0)	17 (0)	5 (0)	0.6 (0)	0.2 (0)

¹ Hazard quotients (HQs) less than or equal to 1 indicate that no effects from spray drift are anticipated to adjacent terrestrial plants at the specified distance. HQs based on application using low boom ground sprayer in agricultural settings overestimate risk of application from backpack sprayers in forest and shrubland settings.

Other Off-target movement (wind erosion, runoff, leaching): Off-target effects from herbicides are primarily a concern for chemicals that remain active in the soil (i.e. herbicide with pre-emergent properties) such as aminopyralid, clopyralid, chlorsulfuron, and imazapyr. Off-target effects could occur from wind erosion moving contaminated soil, water moving across a treated area into an untreated area, or herbicides moving in the soil. Potential for off-target movement is greatest for spot applications, where herbicide is applied directly to the soil, as well as for broadcast application, where there is potential for bare soil areas within the treatment swath. Targeted herbicide applications (directed foliar, wicking and wiping, and drizzle) are expected to have limited risk of movement from runoff since herbicides are not applied directly to the soil, and label directions (e.g. spray to wet only) and design criteria (e.g. DF #1, 2, 3, 5) have been included to minimize the amount of herbicide that would potentially contact soil.

Off-target movement from runoff is modeled in the SERA Herbicide Risk Assessment using the GLEAMS model, an edge of field model that considers annual precipitation and soil texture. Where potential hazards are identified (HQ>1) it is possible that some plant species in the vicinity of the herbicide

application would be affected by off-site movement in runoff. The GLEAMS model predicts the functional off-site application rate assuming broadcast application in an agricultural setting. In wildland settings, local conditions such as slope, topography and drainage patterns will greatly influence the actual potential for adverse effects in the vicinity of herbicide applications. The proposed action also prohibits herbicide application if there is a high probability of precipitation within the subsequent 48 hours (DF #5).

Wind erosion leading to off-site contamination of pesticides is also likely to be highly site-specific. The amount of herbicide that might be transported by wind erosion depends on several factors, including the application method, the depth of incorporation into the soil, the persistence in the soil, the wind speed, and topographical and surface conditions. Wind erosion is calculated as the amount of herbicide that might be transported off-site based on estimates of annual soil loss associated with wind erosion and the assumption that the herbicide is incorporated into the top 1 cm of soil.

Review of exposure scenarios and risk characterizations for proposed herbicides indicate that hazard quotients are below the threshold of concern for the majority of potential off-target exposure scenarios. An exception is potential runoff from clay soils with aminopyralid and clopyralid, which would be addressed by project design features restricting broadcast and spot applications on low permeability soils (DF #36). The proposed action also prohibits broadcast spray with chlorsulfuron, imazapyr, and triclopyr.

Accidental spills: There is always a remote risk of accidental spills or other exposure scenarios other than those described above. To limit the potential for herbicide spills in sensitive plant occurrences and other special plant communities, mixing and loading of herbicides would occur outside of the sensitive plant buffer, RCAs and other sensitive sites, such as special plant communities (DF #6). Another possible exposure scenario for impacts to non-target vegetation is accidental equipment malfunction when treating invasive plant infestations. A design feature requiring regular inspection and tests of all equipment used for herbicide application would greatly reduce the risk of herbicides spills when working in sensitive plant populations (DF #3). All applications would be made by state-certified applicators or workers under their direct supervision who are required to receive annual safety training (DF #1). In addition, a small spill containment kit would be carried by applicators when implementing herbicide treatments to further limit potential effects in the event of equipment failure (DF #7).

Known Sensitive Plants: There are seven known occurrences of sensitive plants within 500 feet of infestations proposed for herbicide application (Table 3). Two occurrences (BOSH-008 and ERMU-001) are near tamarisk infestations, which would be treated by the cut-stump method. In this situation, the greatest risk would be from trampling, since there is no risk of over-spray or spray drift with this application method. Three occurrences (CAEX-001, PHMO-011, and PIAL-018) are greater than 175 feet from infestations proposed for direct foliar spray, so there is little risk from direct exposure or spray drift. Two occurrences (CAEX-002 and PHIN-005) are relatively close (~10 feet) from infestations proposed for direct foliar spray. Portions of the infestation which fall within the 50 foot no-spray buffer around sensitive plants would likely be hand-pulled, or a barrier or other strategy used to protect rare plants during application. If there are undiscovered individuals or populations of sensitive plants within the vicinity of herbicide applications, there would be potential for impacts from herbicide application, which could range from reduced plant vigor, abnormal growth, or necrosis to death of individuals.

Early Detection Rapid Response: Under Early Detection Rapid Response (EDRR), herbicide treatments at new infestations may occur near sensitive plant species if other control methods are likely to be ineffective and impacts to sensitive plants can be avoided by buffers, herbicide selection, application timing, etc. In the event that future control efforts include herbicide application near sensitive plants, the botanist would work closely with applicators to avoid affects from off-target (drift, runoff, leaching) and direct exposure (DF #29, 30, 31). Possible methods to limit affects from drift could include the use of alternative application methods that do not produce driftable fines associated with spray application such as wicking, wiping, drizzle; timing selective application methods so threatened and sensitive plants are not likely to be affected by drift; using a spray cone; covering sensitive plants during herbicide applications; scheduling spray applications when prevailing winds are blowing away from sensitive plant habitat; or flagging and avoiding occurrences. In addition, if herbicides are sprayed within 500 feet of sensitive plants, post-treatment monitoring would be conducted to ensure that the assumption that herbicide application would not adversely affect sensitive plant occurrences is correct.

Biological Control

Biological control is the release of insects or pathogens to assist in the control of larger established infestations of invasive species. The USDA Agricultural Plant Health and Insect Services (APHIS) is the lead agency for biocontrol activities in the US, and is required to complete NEPA analysis and documentation before allowing the use of a specific biological control agent. Use of this method on the INF would comply with the APHIS NEPA document and decision, would be conducted in coordination with the appropriate federal, state, and county agencies, and would be reviewed during the project Annual Implementation Process (AIP). During the AIP, the proposed biocontrol agent would be reviewed and potential effects to specific sensitive plants evaluated against the long-term benefit of the release. Sensitive plant tissue could be consumed or used for larval development by biocontrol insects or affected by pathogens. However, any effects are expected to be minor given that the insects and pathogens approved for biocontrol programs are selective and extensive research is conducted prior to their approval to ensure there is a low risk of affecting non-target native species. This method would not be proposed in a situation where there was a potentially high risk of extensive impacts to sensitive plant species (DF #29). The associated reduction in the number and cover of invasive species with this method is expected to benefit sensitive plant species in the long-term, by reducing competition for resources and preserving native plant diversity.

Revegetation

Revegetation of treated invasive plant infestations is expected to have indirect beneficial effects on sensitive plants and their habitats in the short to long-term as a result of reducing the likelihood of reinvasion and the risk of soil erosion. Revegetation would primarily occur in areas that are highly-disturbed and lacking sufficient native vegetation for passive restoration, conditions which are unlikely to support sensitive plant species initially. There is a slight risk that individual sensitive plants could be trampled by workers or equipment during revegetation, but these effects are expected to be limited in occurrence and short-term. In the long-term, revegetation is expected to enhance habitat conditions for sensitive and other native plant species, by providing competition with invasive species and reestablishing native species composition and cover.

6.1.2 Cumulative effects

Current inventories of sensitive plant species capture the aggregate impact of past human actions and natural events that have led to the current distribution of these species on the Inyo NF (CEQ 2005). Past human actions and natural events are therefore implicit within existing conditions and are addressed within the Existing Environment section above. These include the effects of ongoing invasive plant

treatments by manual and hand application of herbicide, as well as vegetation, recreation, transportation, grazing, and fire management activities. Past effects may also include vegetation management (including herbicide use) on adjacent lands. Cumulative effects for all species analyzed within this document could occur when the direct and/or indirect effects of the proposed action on a given species add incrementally to the effects of past, present, and reasonably foreseeable future actions.

Ongoing forest management activities would have similar effects to analyzed species as the proposed project, since all projects are surveyed and/or reviewed to similar standards as the proposed project or would be prior to treatment implementation, if infestations occur in suitable habitat for sensitive species. In addition, future projects would incorporate similar design features to avoid impacts to known occurrences of Sensitive plant species, unless the project is intended to restore or enhance the species or its habitat and potential impacts are expected to be minor. There is always the chance that some individuals of some Sensitive Plant occurrences may be adversely affected by proposed project activities, especially if there are undiscovered individuals or populations. However, these impacts are not expected to be so great in intensity or duration that any of the known occurrences would be eliminated, even when combined with other ongoing Forest activities and projects. As with ongoing actions, future actions on NFS lands would be surveyed to similar standards and mitigations developed to ensure that any impacts to Sensitive plant species are either beneficial or mitigated so that the long-term viability of each Sensitive plant species on the forest is maintained.

Past, ongoing and foreseeable future actions would add cumulatively to the potential direct and indirect effects of the proposed action as described above. The implementation of the proposed action may result in some minor, short-term potential adverse direct and indirect effects from trampling or herbicide drift, but also will provide longer-term beneficial effects to sensitive plant habitat and native vegetation communities from control and eradication of invasive plant species. Because the majority of the known occurrences of Sensitive plant species on the forest are greater than 500 ft. from current high priority treatment areas, no direct effects to these occurrences are currently anticipated. There is, however, the potential that surveys around new infestations prioritized for treatment in subsequent years may detect new Sensitive plant occurrences in the vicinity of proposed treatment areas. Direct and indirect effects to new occurrences under EDRR treatments are expected to be comparable to those described above.

For the six sensitive species that are currently known to occur within 500 feet of high priority treatment sites (Table 3), these specific occurrences do not constitute the entirety of their distribution on the INF (except for *Erigeron multiceps*). For all species, there are also additional occurrences on adjacent land ownerships. Although project effects would add cumulatively to the effects of past, ongoing and future actions for sensitive species on the forest, these effects are not expected to lead to a loss of viability or trend toward federal listing for any sensitive species on the Inyo NF.

7 DETERMINATIONS

Candidate Species

It is my determination that the Invasive Plants Treatment Project may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for *Pinus albicaulis*. This determination is based on the implementation of design criteria to protect occurrences and suitable habitat during invasive plant treatments.

Sensitive Species

It is my determination that the Invasive Plants Treatment Project may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for any Region 5 Sensitive species. This determination is based on the implementation of design criteria to protect occurrences and suitable habitat during invasive plant treatments.

8 DESIGN CRITERIA

Design criteria and monitoring are included as part of the project description to minimize impacts to sensitive species in the project area (Draft EA, Section 2.1.8). Design criteria were developed using guidance provided in the Forest Service Manual, the INF Land and Resource Management Plan (as amended by SNFPA), Species Management Guides and Conservation Agreements, and other relevant references and survey results. Project design criteria relevant to botanical resources are detailed in Section 3 of this document. The full list of project design criteria can be found in the Draft Environmental Assessment for this project.

9 REFERENCES

Endangered Species Act (ESA). 1973. Public Law 93-205, 87 Stat. 884, 16 U.S.C. 1531-1544.

- INF. 2007. Weed Eradication and Control on the Inyo National Forest Environmental Assessment. Bishop, CA.
- INF. 2010. Perennial Pepperweed Eradication on Blackrock-Kern and Wildrose Trails Environmental Assessment. Bishop, CA.
- INF. 2017. Mono Lake Bassia Control Decision Memo. Bishop, CA.
- INF. 2017. Sensitive plant habitat and occurrence maps, unpublished occurrence and monitoring records, and Sensitive plant GIS database. INF SO Botany files. Bishop, CA.
- Jepson eFlora Project. 2018. Jepson eFlora [on-line application]. Ed.: Baldwin, B., et. al. http://ucjeps.berkeley.edu/IJM.html. Accessed through: The Jepson Online Interchange, California Floristics, University of California, Berkeley. http://ucjeps.berkeley.edu/interchange.html.
- Marer, P.J. 2000. The Safe and Effective Use of Pesticides Second Edition. University of California, Statewide Integrated Pest Management Program, Publication 3324. Oakland, CA.
- Syracuse Environmental Research Associates, Inc. (SERA). 2014. Preparation of Environmental Documentation and Risk Assessments for the USDA/Forest Service. November 17, 2014. SERA MD-2014-02b. Prepared for USDA Forest Service. Syracuse Environmental Research Associates, Inc. Manlius, NY.
- USDA FS. 1988. Inyo National Forest Land and Resource Management Plan. Pacific Southwest Region, Inyo National Forest, Bishop, CA.
- USDA FS. 2004. Sierra Nevada Forest Plan Amendment, Final Supplemental Environmental Impact Statement. Pacific Southwest Region. Vallejo, CA.
- USDA FS. 2005. Forest Service Manual: Wildlife, Fish, and Sensitive Plant Habitat Management (chapter 2672.4), Amendment 2600-2005-1. Effective 9/23/2005.

USFWS. 2018. Federal Endangered and Threatened Species that occur in or may be affected by projects in the Inyo National Forest. U.S. Fish and Wildlife Service, Available online at: https://ecos.fws.gov/ipac/ Accessed August 17, 2015.